AMENDMENTS TO THE DRAWINGS

The attached formal sheet includes Figure 10, and replaces the sheet including FIG. 10 originally filed with the application. Applicants have added π to the equation 1001 shown in FIG. 10. Support for this amendment can be found in the application as originally filed, for example paragraph [0048] of the application as published under U.S. Publication No. 2005/0103508. Accordingly, no new matter is introduced by the amendment to FIG. 10.

REMARKS

Claims 1, 3-8, 10-20 are now pending in the application. Claims 1, 4, 8, and 12 are amended. Claims 15-20 are added.

Claims 2 and 9 are cancelled hereby without prejudice to the subject matter container therein. Applicants reserve the right to refile these cancelled claims and contest the rejections thereof in one or more subsequent applications.

The Examiner is respectfully requested to reconsider and withdraw the rejections in view of the amendments and remarks contained herein.

REJECTION UNDER 35 U.S.C. § 112

Claims 4 and 12 stand rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point and distinctly claim the subject matter which Applicants regard as the invention. This rejection is respectfully traversed.

Applicants have amended claims 4 and 12 to delete "the first three harmonic mode shapes", and have added a first harmonic (fundamental frequency) mode shape, a second harmonic mode shape, and a third harmonic mode shape. Applicants respectfully submit that claims 4 and 12 are sufficiently definite as to permit those skilled in the art to readily understand the scope of such claims. See, also for example, FIG. 5 and paragraph [0041] in the application as published under U.S. Publication No. 2005/0103508. For at least these reasons, Applicants respectfully request withdrawal of the § 112 rejection.

REJECTION UNDER 35 U.S.C. § 102

Claims 1, 3-8, and 10-14 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Rockwell (U.S. Pat. No. 4,030,553). This rejection is respectfully traversed.

Aspects of the present application relates to providing a tool for a powered machine with vibration damping means, in order to reduce potentially injurious vibration. In particular, embodiments of the present application are primarily concerned with reducing hand-arm vibration syndrome in operators of powered tools.

According to various aspects of the invention, the tool in use is modeled as having hinged-free boundary conditions, with the tip of the shaped working end hinged and the tip of the striking end free. The position of at least one antinode of the vibration

along the tool shank is estimated. A damping member is then fitted around the body of the tool, located to cover at least one estimated antinode position.

During operation of a powered tool, a plurality of different waves may be introduced to the tool. The inventors hereof have recognized that longitudinal waves contribute to transmitted vibration (and hence to hand-arm vibration syndrome) and transverse (flexural) waves contribute to sound output. Due to the establishment of different wave types within a powered tool, the reduction of undesirable vibration therefrom is a complex problem.

Aspects of the present invention are concerned with reducing the reflection of energy carried by waves introduced into the tool by the driver, in order to reduce potentially injurious vibration transmitted to the operator of the tool. Aspects of the present invention also have the effect of reducing undesirable noise.

To this end, independent claim 1 recites a method for providing a tool for a powered machine. The tool comprises a body having a shaped working end and a striking end. The tool also includes vibration damping means. The shaped working end has a tip, and the striking end has a tip. The method comprises determining an estimated antinode position of vibration of the tool in use when the tip of the shaped working end is hinged and the tip of the striking end is free to vibrate, and locating a vibration damping member around the body of the tool to cover the antinode position.

Independent claim 8 recites a tool for a powered machine. The tool comprises a body having a shaped working end and a striking end. The tool also includes vibration damping means. The shaped working end has a tip, and the striking end has a tip. The vibration damping means comprises a vibration damping member located around the body of the tool to cover an estimated antinode position of vibration of the tool in use when the tip of the shaped working end is hinged and the tip of the striking end is free to vibrate.

In contrast, Rockwell merely discloses a method of constructing a percussion tool, and a tool so constructed. Rockwell teaches introducing an impedance mismatch in the form of a structural discontinuity along the tool, to provide noise reduction.

According to Rockwell, a prototype tool is struck and troublesome noise frequencies to be reduced identified. A resonant, bending mode shape for the prototype tool is determined by an approximation comparison between resonant frequencies of the prototype tool and resonant frequencies of bending mode shapes of a beam bending under different boundary conditions, i.e., simply supported and free-free. A tool having

the same length as the prototype tool is then constructed from a plurality of tool sections, which are joined to introduce at least one structural discontinuity along the tool at, or at a predetermined distance from, an antinode of the determined bending mode shape. See, for example, Rockwell, Column 5, lines 16-30:

> In the preferred embodiment a tool is first formed as a single member of predetermined length. The tool is then transversely cut at selected points, forming two or more sections. The tool is then reassembled either with the original sections with appropriate machining, where necessary, or one or more of the sections is replaced by a newly constructed section of such a length that when joined the reassembled tool length is substantially equal to the original predetermined length of the tool. Reconstructing the tool in this manner introduces impedance mismatches at the junctions of the sections. It is also contemplated that the tool may be formed by initially constructing the desired number of sections, each being of selected length, and then assembling the sections.

The approach of Rockwell is in contrast to that recited in claims 1 and 8, wherein a vibration damping member is located around the body of the tool to cover an estimated antinode position of vibration of the tool when in use. In various aspects of the present invention, there is provided a single model of a tool in use, for applying to each tool under consideration. The model provides bending mode shapes for a beam bending under sole predetermined boundary conditions (e.g., hinged free boundary conditions; with the tip of the shaped working end modeled as a hinge and the tip of the striking end modeled as a free boundary, free to vibrate), from which one or more estimated antinode positions along the tool are derived. Accordingly, aspects of the present invention therefore utilize a type of modification of a tool to change vibration of the tool when in use that is different than the modification employed by Rockwell. Further, the claimed inventions recite different methods than that of Rockwell for determining a location along the tool at which to locate vibration damping means.

Rockwell discloses an embodiment, shown in Figure 3, in which two tool sections are joined by threaded portions. Rockwell also discloses embodiments, shown in Figs. 6, 7 and 8, in which two tool sections are force fitted together and an outer sleeve is used to maintain the joint. Rockwell, Column 5, Lines 50-54 state that "In the embodiments of FIGS. 6, 7 and 8 the outer sleeve itself does not materially contribute to the impedance mismatch but rather serves to hold the parts in assembled relationship."

Indeed, Applicants have not found any disclosure in Rockwell regarding the material(s) from which the outer sleeve is fabricated. Thus, Applicants respectfully submit that Rockwell does not disclose or teach using the outer sleeve as a vibration

damping member, and therefore Rockwell does not disclose or teach locating a vibration damping member around the body of a tool, as recited in independent claims 1 and 8.

In view of the above, Applicants respectfully submit that Rockwell fails to disclose a vibration damping member located around the body of the tool to cover the antinode position as recited by independent claim 1 or 8. For this reason alone, the section 102 rejections should be withdrawn.

With regard to dependent claims 2-3, 5-7, and 10-14, these claims each depend from a claim shown above to be allowable. Accordingly, Applicants respectfully submit that claims 2-3, 5-7, and 10-14 are also allowable for allowance for at least the reasons given above in connection with the independent claim from which it depends.

In addition, the cited patents also do not render obvious the claimed inventions. Jensen discloses a method of constructing a percussion tool, and a tool so constructed. Jensen teaches providing the tool with a two-part damping component comprising a damping medium layer constrained within a tube, to provide noise reduction. According to Jensen, the constrained layer damping medium is usually a viscoelastic material, which is bonded both to the tool and to the outer constraining tube, which extends substantially along the entire length of the tool shaft.

But Applicants have not found any teaching or suggestion in Jensen regarding determining an estimated antinode position of vibration of the tool in use, and locating the constraining tube and damping medium layer to cover the estimated antinode position, as recited in independent claims 1 and 8. Plus, the constrained viscoelastic damping medium layer of Jensen is not considered to be a viscoelastic vibration damping member as described for various embodiment the present application.

In addition, Jensen and Rockwell take different approaches to the problem of reducing noise from a percussion tool. Jensen uses a two-part damping component located upon the tool and extending substantially along the entire length of the tool shaft to achieve noise reduction. Jensen describes that there is little reduction in the practical use of the tool by added weight or obstructions from the two-part damping component.

In Rockwell, it is disclosed in Column 5, Lines 7-15 that introducing an impedance mismatch by constructing the tool from tool sections to create structural discontinuities provides noise reduction without causing an appreciable increase in weight or bulkiness of the tool. Therefore, it is respectfully submitted that Rockwell provides an alternative technique to Jensen's use of an additional component upon the tool to achieve noise reduction. Because Jensen and Rockwell provide different

solutions to the same problem, Applicants submit that it would not be obvious to consider the teaching of either document in light of the other. Starting with Rockwell, it would not be obvious (or would there be any need or motivation) to provide any additional damping by means of a separate component located upon the tool. Conversely, and starting with Jensen, it would not be obvious (or would there be any need or motivation) to first create a model of the tool in use, to then use that model to determine a position at which to locate the two-part damping component upon the tool, and finally to locate the two-part damping component at that position.

As noted above, aspects of the present invention provide a model of a tool that is used for determining a position at which to locate a vibration damping member around the tool, as recited in independent claims 1 and 8. It is therefore submitted that even when the teachings in Jensen and Rockwell are considered together, any logical combination would still result in subject matter different from that of independent claims 1 and 8. For at least these additional reasons, Applicants respectfully submit that all pending claims are novel and non-obvious over the cited art.

REJECTION UNDER 35 U.S.C. § 103

Claims 2 and 9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Rockwell (U.S. Pat. No. 4,030,553) in view of Jensen et al (U.S. Pat. No. 3,842,942). This rejection is respectfully traversed.

The cancellation of claims 2 and 9 has rendered moot the rejections thereof. Accordingly, Applicants respectfully request reconsideration and withdrawal of the Section 103(a) rejections.

NEW CLAIMS

New claims 15-20 are supported by the application as originally filed. Accordingly, no new matter is introduced by the addition of claims 15-20.

In addition, claims 15-20 each depend from an independent claim shown above to be allowable. Accordingly, Applicants respectfully submits that dependent claims 15-20 are also in condition for allowance for at least the reasons set forth above in connection with the independent claim from which it depends.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (314) 726-7502.

Applicants believe that the appropriate fees have been included with this filing. If, however, Applicants owe any additional fee(s), the Commissioner is hereby authorized to charge the fee(s) to Deposit Account No. **08-0750**. In addition, if there is ever any other fee deficiency or overpayment under 37 C.F.R. §1.16 or 1.17 in connection with this patent application, the Commissioner is hereby authorized to charge such deficiency or overpayment to Deposit Account No. **08-0750**.

Respectfully submitted,

Dated: July 1, 2005

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